IN THE SPECIFICATION:

Please amend the paragraph running from page 1, line 5, to page 3, line 6, of the specification as follows:

The present document contains subject matter related to that disclosed in commonly owned, co-pending application Serial No. 09/209,460 filed December 11, 1998, entitled ULTRA WIDE BANDWIDTH SPREAD-SPECTRUM COMMUNICATIONS SYSTEM (Attorney Docket No. 10188-0001-8); Serial No. 09/633,815 filed August 7, 2000, entitled ELECTRICALLY SMALL PLANAR UWB ANTENNA (Attorney Docket No.10188-0005-8); Application Serial No. 09/563,292 filed May 3, 2000, entitled PLANAR ULTRA WIDE BAND ANTENNA WITH INTEGRATED ELECTRONICS (Attorney Docket No. 10188-0006-8); Application Serial No. 60/207,225 filed May 26, 2000, entitled ULTRA WIDEBAND COMMUNICATION SYSTEM AND METHOD (Attorney Docket No. 192408US8PROV); Application Serial No. ~~XX/XXX,XXX~~ 60/238,466, filed October 10, 2000, entitled ULTRA WIDE BANDWIDTH NOISE CANCELLATION MECHANISM AND METHOD (Attorney Docket No.193517US8); Application Serial No. 60/217,099 filed July 10, 2000, entitled MULTIMEDIA WIRELESS PERSONAL AREA NETWORK (WPAN) PHYSICAL LAYER SYSTEM AND METHOD (Attorney Docket No.194308US8PROV); Application Serial No. ~~XX/XXX,XXX~~ 09/685,203, filed October 10, 2000, entitled SYSTEM AND METHOD FOR BASEBAND REMOVAL OF NARROWBAND INTERFERENCE IN ULTRA WIDEBAND SIGNALS (Attorney Docket No.194381US8); Application Serial No. ~~XX/XXX,XXX~~ 09/685,197, filed October 10, 2000, entitled MODE CONTROLLER FOR SIGNAL ACQUISITION AND TRACKING IN AN ULTRA WIDEBAND COMMUNICATION

SYSTEM (Attorney Docket No. 194588US8); Application Serial No. ~~XX/XXX,XXX~~

09/684,400, filed October 10, 2000, entitled ULTRA WIDEBAND COMMUNICATION

SYSTEM, METHOD, AND DEVICE WITH LOW NOISE PULSE FORMATION (Attorney

Docket No. 195268US8); Application Serial No. ~~XX/XXX,XXX~~ 09/685,195, filed October 10,

2000, entitled ULTRA WIDE BANDWIDTH SYSTEM AND METHOD FOR FAST

SYNCHRONIZATION (Attorney Docket No. 195269US8); Application Serial No.

~~XX/XXX,XXX~~ 09/684,401, filed October 10, 2000, entitled ULTRA WIDE BANDWIDTH

SYSTEM AND METHOD FOR FAST SYNCHRONIZATION USING SUB CODE SPINS

(Attorney Docket No. 195272US8); Application Serial No. ~~XX/XXX,XXX~~ 09/685,196, filed

October 10, 2000, entitled ULTRA WIDE BANDWIDTH SYSTEM AND METHOD FOR

FAST SYNCHRONIZATION USING MULTIPLE DETECTION ARMS (Attorney Docket No.

195273US8); Application Serial No. ~~XX/XXX,XXX~~ 09/685,199, filed October 10, 2000,

entitled A LOW POWER, HIGH RESOLUTION TIMING GENERATOR FOR ULTRA-WIDE

BANDWIDTH COMMUNICATION SYSTEMS (Attorney Docket No. 195670US8);

Application Serial No. ~~XX/XXX,XXX~~ 09/685,202, filed October 10, 2000, entitled METHOD

AND SYSTEM FOR ENABLING DEVICE FUNCTIONS BASED ON DISTANCE

INFORMATION (Attorney Docket No. 195671US8); Application Serial No. ~~XX/XXX,XXX~~

09/685,201, filed October 10, 2000, entitled CARRIERLESS ULTRA WIDEBAND WIRELESS

SIGNALS FOR CONVEYING APPLICATION DATA (Attorney Docket No. 196108US8);

Application Serial No. ~~XX/XXX,XXX~~ 09/685,205, filed October 10, 2000, entitled SYSTEM

AND METHOD FOR GENERATING ULTRA WIDEBAND PULSES (Attorney Docket No.

197023US8); Application Serial No. ~~XX/XXX,XXX~~ 09/684,782, filed October 10, 2000,

entitled ULTRA WIDEBAND COMMUNICATION SYSTEM, METHOD, AND DEVICE

WITH LOW NOISE RECEPTION (Attorney Docket No.197024US8); and Application Serial

No. ~~XX/XXX,XXX~~ 09/685,200, filed October 10, 2000, entitled LEAKAGE NULLING

RECEIVER CORRELATOR STRUCTURE AND METHOD FOR ULTRA WIDE

BANDWIDTH COMMUNICATION SYSTEM (Attorney Docket No. 1541.1001/GMG), the

entire contents of each of which being incorporated herein by reference.

Please amend the paragraph on page 9, lines 10-21, of the specification as follows:

These and other objects are accomplished by way of a receiver front end for a UWB

receiver that employs as part of its functions, an RFI nulling filter with an impulse response

comprised of a plurality of time-delayed and possibly inverted impulsive waveforms (e.g.

derivative of a step function). In order to support the bandwidth of the desired signal, the width

of the impulse waveform should be less than the width of a half cycle of the highest frequency

(e.g. the frequency point that is 10 dB down from the peak).[.] The time delay is chosen

according to two criteria. First, the delay is chosen long enough so that the output of a matched

filter receiver, in response to a single received event (or transmitted wavelet), is comprised of one

or more peaks, where at least one of these peaks is equal, or nearly equal, to the peak that would

have been obtained from a matched filter. Second, the delay is chosen to be short enough so that

the narrower bandwidth RFI signal is essentially an unmodulated tone over the duration of the

impulse response of the nulling filter.[.]

Please amend the paragraph on page 10, lines 1-13, of the specification as follows:

The first criterion allows the desired UWB signal to be detected at the peak of the

receiver's output signal without loss. By no loss we mean that the same peak voltage relative to

an ideal matched filter receiver is observed. The phenomena is explained by noting that the

operation of the RFI nulling filter can be understood as two waveforms being convolved with

each other in time. In the case of the desired signal, the two waveforms are the time domain

matched filtered (i.e. compressed) waveform of the desired signal, and the time domain impulse

response of the RFI nulling filter. The phenomenon by which there is no loss is due to the fact

that the time domain impulse response of the RFI nulling filter is comprised of [a] impulsive

terms that are far enough apart that they do not simultaneously interact with the matched filtered

(i.e. compressed) desired signal. In other words, only one impulsive term interacts with the

desired signal at any particular time. As a result, there is no interference pattern, or no destructive

interference to the desired signal. The RFI nulling filter might be thought of as having the effect

of adding known resolvable multipath to the channel.

Please amend the paragraph running from page 10, line 15, to page 11, line 17, of the

specification as follows:

_____The second criterion allows the RFI signal to be canceled even though it may be in the

center spectrum of the desired signal, yet even while the detected peak of the desired signal is

maintained with no loss. In other words, the full spectrum of the desired signal is maintained, yet

the overlapping spectrum of the narrowband RFI is nulled. RFI cancellation is achieved because

narrowband signals, such as the RFI, have a long extent in time and therefore interacts

simultaneously with all the impulsive terms in the impulse response of the RFI nulling filter.

The inventors recognized that this overlap is in contrast to the UWB signal, which is only present

on one term at a time of the RFI nulling filter's impulse response, allowing the filter to operate

differently on the two waveforms. The spacing and phases of the impulsive terms are chosen to

cause equal in-phase and out-of-phase contributions such that the RFI is canceled. For example,

consider an RFI nulling filter with two equal-amplitude and opposite-phase impulsive waveforms

~~space~~ spaced exactly one wavelength apart at the center frequency of an RFI signal. In this case

as the waveforms convolve with one another, the points on the RFI waveform that strike the two

impulsive terms are always at the same voltage (since they are one wavelength apart). Since the

two impulsive terms are of opposite phase (e.g. +1 an −1) the RFI sums to zero at all points in the

convolution and is therefore canceled. Similarly, for example, consider an RFI nulling filter with

two equal-amplitude and in-phase impulsive waveforms separated by ½ wavelength at the center

frequency of the RFI signal. In this case when the RFI waveform and filter impulse response

convolve with one another, the points on the RFI waveform that strike the two impulsive terms

are always at equal but opposite voltages (since they are a half wavelength apart). Since the two

impulsive terms are of equal amplitude (e.g. +1 and +1), the RFI sums to zero at all points in the

convolution and is therefore canceled. To extend the above examples, these two-term filters may

be built for various frequencies and connected in series to form multiple RFI nulls, while

continuing to pass the UWB signal. The resulting composite filter would have a plurality of

impulsive functions.

Please amend the paragraph running from page 11, line 19, to page 12, line 11, of the

specification as follows:

While it might appear that applying the RFI nulling filter directly to the desired signal

prior to matched filtering would be problematic due to the fact that the desired signal may extend

across more than one impulsive term of the RFI nulling filter—indeed it may extend across the

entire filter. The inventors, however, recognized that since the convolution operator is

communicative, the ordering of the filtering operations is arbitrary. This is important since the

simplest programmable receiver requires a sliding correlator structure as opposed to a real-time

matched filter.

While several embodiments are disclosed herein, one embodiment would be to include

one or more stub circuits in the receiver front end arranged to pass the UWB signal, but cancel an

RFI signal. Another embodiment would be to include one or more sub-circuits that include a

splitter, one path delayed relative to the other, and one path possibly inverted relative to the

other, and the two paths combined in a summer. Another embodiment would include a same

sub-circuit, but with an adaptive delay for adapting the null frequency to cancel observed RFI. In

order to extend the apparent dynamic range of an amplifier, in another embodiment the stub can

be located at a distance away (e.g. to reflect a short circuit at the notch frequency) from the

amplifier so as to prevent the amplifier from saturating

Please add the following paragraph on page 13, between lines 16 and 17:

Figure 8D shows a preferred embodiment of the isolation devices of Fig. 8A;

Please amend the paragraphs on page 14, lines 6-10, as follows:

Figure 14 is a block diagram that shows the use of a matched filter after the RFI extraction

network in a UWB receiver system; ~~and~~

Figure 15 shows respective time and frequency plots of a chirped waveform before and

after being compressed by way of being applied to a matched filter according to the present

invention; and[.]

Please add the following three paragraphs on page 14, between lines 11 and 12:

Figures 16A through 16C show preferred embodiments of the amplifiers in Figure 8A.

Please amend the paragraph on page 25 lines 3-8, of the specification as follows:

During signal acquisition, the radio controller and interface 9 adjusts the phase input of, for example, the timing generator 71, in an attempt for the tracking correlator 311 to identify and ~~the~~ match the timing of the signal produced at the receiver with the timing of the arriving signal. When the received signal and the locally generated signal coincide in time with one another, the radio controller and interface 9 senses the high signal strength or high SNR and begins to track, so that the receiver is synchronized with the received signal.

Please add the following two paragraphs between the end of the paragraph on page 34, lines 11-22, and the beginning of the paragraph on page 35, lines 1-15:

The circuit preferably includes a two-way splitter 390 that splits the signal from the LNA 110, providing one split signal to the input of the first amplifier 300, and one input to the first input of the summer 330. In alternate embodiments, a first isolation device 392 may be used between the first amplifier 300 and the two-way splitter 390, and/or a second isolation device 394 may be used between the summer 330 and the two-way splitter 390. As shown in Figure 8D, each isolation device 392, 394 may include an inverting amplifier 396.

As shown in Figures 16A-16C, the amplifiers 300, 310, and 320 can each comprise a transmission line 1610 (as shown in Fig. 16A), a series of series inductor (L) sections 1620 and shunt capacitor (C) sections 1630 (as shown in Fig. 16B), or a series of series resistor (R) sections 1640 and shunt capacitor (C) sections 1630 (as shown in Fig. 16C). In some

embodiments, one or more of the shunt capacitor sections 1630 can be electrically adjustable, such as a varactor.

Please amend the paragraph on page 35, lines 1-15, of the specification as follows:

The receiver 370, in one embodiment, detects the signal energy level of the largest RFI signal and the signal-to-noise ratio (SNR) of that RFI signal. The power sensor 380 senses the output power from the summer 330, in an attempt to isolate the most problematic RFI. The controller 340, operates in two modes. In one mode, the controller sweeps the notch frequency and settles at the frequencies that provides the lowest energy as registered by power sensor 380. In the second mode, the controller determine the frequencies containing the most energy, and then sets the notch frequencies accordingly. Predetermined values in a memory table are often required to adjust the bias on the respective amplifiers, and/or the respective delays by asserting control over switches 350 and 360, due to non-linear mapping of bias to notch-frequency. In this way, the controller 340 adjusts the relative spacing of the first element 231 and second element 232 (Figure 8(B)) so that the impulse response of the RFI extraction mechanism will cancel the predominant RFI. As an alternative, the controller 340 may attempt to optimize the reception quality by using the detection quality metrics such as proportional to the bit error rate (BER), for example, as described in co-pending application serial no. 09/685,197, filed October 10, 2000, entitled MODE CONTROLLER FOR SIGNAL ACQUISITION AND TRACKING IN AN ULTRA WIDEBAND COMMUNICATION SYSTEM (Attorney Docket No. 194588US8).[r]

Please amend the paragraph running from page 40, line 1, to page 41, line 2, of the specification as follows:

Figure 15 will be used to describe several of these features. Figure 15 shows in the upper left hand corner thereof a chirped wavelet in the time domain. The equation for producing such a waveform may be seen in the following equation

$$g_{t1_i,t2_i,tr_i,tf_i,w_i,k_i}(t) = \left(\cfrac{1}{e^{\frac{-(t-t1_i)}{.3*tr_i}} + 1} - \cfrac{1}{e^{\frac{-(t-t2_i)}{.3*tf_i}} + 1} \right) \cdot \sin\left(\omega_i t + k_i t^2\right).$$

Assuming the pulse starts at time t=0, the parameters include the starting frequency, ω, the stopping frequency $\omega + kT$, the rise time tr, the center of the rise time t1, the fall time tf, and the center of the fall time t2. Example values are ω=1, tr=tf=0.25, t1=tr/.51, and t2=T-tr/9 where T is the pulse width. These chirped waveforms may be sent in sequences separated in time from one another by differing amounts, or by a same amount. PPM is an example where the amount of separation differs. For a given wavelet shape, such as the chirped wavelet shape in the upper left hand corner of Figure 15, a corresponding frequency domain representation of the wavelet may be obtained by way of a Fourier transform. The time domain version in the upper left hand corner is thus represented g(t) and the Fourier transform version is represented by G(w) shown in the right most plot. Accordingly, the output of the matched filter is represented as P(w)= G(w) • G^*(w) is also shown in the right most plot. The output P(w) of the matched filter in the time domain is seen by performing an inverse Fourier transform on H(w) so as to obtain p(t), which is shown in the bottom left hand corner of Figure 15. The compressed pulse is shown as a solid line, where an envelope with a compressed pulse is shown as a dashed line. A width of the compressed pulse h(t) is defined by Tc which is the time between the points on the envelope E(t) of the compressed pulse that are 6dB below the peak thereof.[.] The envelope may be determined by the equation

$$E(t) = \sqrt{(p(t))^2 + \left(p^H(t)\right)^2}$$

where $p^H(t)$ is the Hilbert transform of h(t).